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Costs Efficiency Of The Public Universities

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Preface

The book reports the results of a doctoral research project on economic analysis of costs of public universities in Bangladesh. The project is directed by the author and supervised by Professor Du Yuhong, Ph.D, a Professor of Education Economics at the Beijing Normal University, PR China.

However, the doctoral research project involved the contributions of Dr. Gang Cheng, Dr. Long Long Huo, Professor Geraint Johnes of the Lancaster University Management School, UK and Professor William Greene of the Stern School of Business, USA.

The research was conducted in the context Bangladesh, where data collection work was one of the most challenging parts of my doctoral research. I would like to express my sincere most appreciation, and thankfulness to the Chairman of the University Grant Commission (UGC) of Bangladesh for extending efforts to ensure smooth data collection work; in this regard, particularly I must acknowledge contribution of Mr. Liakat Hossain, an official of the UGC publication department, who assisted me during my data collection work. Furthermore, I would like to thanks numerous anonymous referees who were involved in reviewing my paper at different stages.

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All Acronym used in the book

Bangladesh Agriculture University	=	BAU
Bangabandhu Sheikh Mujibur Rahaman Ariculture University	=	BDSMRAU
Bangladesh University of Engineering and Technology	=	BUET
Chittagaong University of Engineering and Technology	=	CUET
Chittagaong University	=	CU
Dhaka University of Engineering and Technology	=	DUET
Dhaka University	=	DU
Hajee Muhammad Danash Science and Technology University	=	HMDSTU
Islamic University	=	IU
Jahangirnagar University	=	JU
Khulna University of Engineering and Technology	=	KUET
Khulna University	=	KU
Maolana Vashani Science and Technology University	=	MVSTU
Patuakhali Science and Technology University	=	PUST
Rajshahi University of Engineering and Technology	=	RUET
Rajshahi University	=	RU
Shere-e-Bangla Agriculture University	=	SAU
Sylhet University of Science and Technology	=	SUST

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CHAPTER I: INTRODUCTION

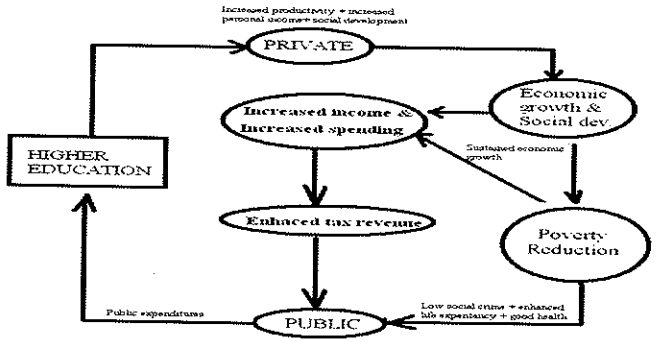
1.0. Background of the study

The theory of human capital investment advocates for contribution of education towards natural economic growth. In today's world, global economic advantages are rapidly emerging in nations where widespread educational investments have become national priority (Alexander, 2000). In the developing countries, the undeniable role of education in development often link primary education with economic development leaving out higher education as less priority area of interest. Of lately, such paradigm has been being shifted toward higher education. Still a complete view of the roles of higher education in the socio-economic development is obscure in the developing countries like Bangladesh due to lack of available research study in the field of economics of education. In the context of Bangladesh, the researcher searches for literature, and has found a number of research paper addressed the issue dealing with 'the return to education', where the past researchers have found private return to higher education in greater than return to primary education i.e. 12.8% for higher education compared with 4.1% for primary education (Asadullah, 2006). Such personal benefits, in fact, may be translated into social (or public) benefits in terms of economic and social development, poverty reduction etc. Figure1 depicts a likely link between the higher education and economic development. The Figure, furthermore, shows a link between the private and public interests too. Observing the Figure 1, one can have conception of how private benefit, in fact, may be translated into the national (public) benefits through a channel of contribution to increased productivities, enhanced employment opportunities, and enhanced salary and fringe benefits. At this stage, Table 1 may be useful to illustrate the notion further.

Lower part (shaded area) of the Table 1 indicates population with higher education attainment and their average per capita income. As per the table, an average per capita household income of the population with higher education attainment is as twice as average per capita income of the population with education attainment below secondary/higher

secondary school certificate (SSC/HSC) (upper part of the Table 1). It implies that with higher education attainment a graduate is capable of being benefited by his/her enhanced income level; on the other hand, the increased private income is injected into the national economy through enhanced consumption expenditures by the consumers, that may bring about changes by enhanced tax revenue earning opportunity for the government at the end of the pipe.

Figure 1: A link between higher education and development



We report in Table 2 distribution of population by education attainment in Bangladesh, and the P.R.China. Observing the Table 2 we learn that the percentage of population having higher education attainment in Bangladesh is almost half of the percentage of population having higher education attainment in the P.R.China. Comparatively, percentage of the population having higher education attainment is very bleak in Bangladesh

In a globalised world where the knowledge economy is getting stronger day by day, higher education can help to generate human capitals with adequate skills required for either generating technological innovation or absorbing new technological knowledge. Observation reveals that without technological knowledge, a country cannot reach at the desired level of development; and a large number of well-educated graduates can contribute to this end very significantly.

disciplines; the science & engineering universities involved in teaching both science and engineering disciplines ; finally the engineering universities involved in teaching engineering disciplines exclusively. Since 1971 until 2007, an expansion of higher education opportunities takes place horizontally increasing the total numbers of the public universities from six in 1972 to twenty five in 2007 (excluding the NU and BOU). Total numbers of students' enrolment increases from 2,545 in the year 1972 to 163,004 in the year 2007. In spite of that, students' enrolment is not enough compared with rising demand of higher education. In the year 2008 a total of 466,570 students graduates from high schools, and of them 117,929 students obtain grade point average 4 and above. In implies that only 34% students can be accommodated by the public universities only. In the backdrop of the increasing demand, the government of Bangladesh undertakes a plan of expansion higher education opportunity. To this end, a policy document titled 'Strategic Plan for Higher Education for the year 2006-2026' is formulated and published by the University Grant Commission (UGC). We argue that such plan is devoid of any economic reasoning due to lack of empirical evidences in support of proposed plan. We have learned from relevant literature that in a numbers of countries context, the public university system has economies of scale. If the lesson we learned, is similar to in the case of Bangladesh, further horizontal expansion of higher education opportunity might generate wastage of scare resources. Alternatively, we can formulate a judicious expansion plan relying on empirical findings that might help us to overcome financial constraints the public universities have been experiencing currently, and expedite smooth implementation of higher education expansion policy in the future.

CHAPTER II : THE LITERATURE REVIEW & CONCEPTUAL FRAMEWORK

2.1. Introduction

The chapter is devoted to literature review that is concerned with economic analysis of higher education institutional costs around the world. In order to select literature, we emphasize on studies that involve Bangladesh. If it is not available, we search for studies in other country context.

Available literature on higher education costs studies can be classified into two broad categories – literature on descriptive analysis of costs, and literature on only empirical analysis of costs. Literature belong to the first category discuss unit costs of the academic institutions along with institutional costs behaviour. On the other hand, literature belong to the latter group investigate both costs and institutional performance using economic theory, parametric, and non-parametric estimation techniques.

During reviewing literature on descriptive analysis of higher education costs, we confine ourselves to the studies directly involve Bangladesh, and the other neighbouring countries that are having socio-economies status very similar to Bangladesh has. At the end of our review, we expect that we understand as for how institutional cost was behaving in the past, what factors had contributed to the changing costs pattern, and how the factors had made an effect on unit costs.

During reviewing of literature on empirical research studies, we open our geographical boundary and search for literature that on higher education cost efficiency; furthermore, we try to track down comparatively new studies where new research methodologies (or approaches) have been applied. Rationality for this type of selection is that we are looking forward to having knowledge on recent findings in quantitative research methodology. During our review, we do not forget to give attention to cost function models used, variables used for cost technology specifications, and estimation techniques used in the past.

Tan and Mingat (1992:26-32) carried out a study under the auspices of the World Bank about education costs in the Asia over twenty

costly of the two is preferred on efficiency grounds. Because the savings associated with the use of the less – costly input combination can be used to pursue other outcomes and thereby enlarge the stock of goods and services that ultimately contribute to individuals' well-being (Monk, 1990).

While a firm experiences cost inefficiency. It may spring from its wrong size or scale either technical efficiency or allocative efficiency or both. Usually the producer is not aware of such element of cost inefficiency. Baumol et al. (1982: 348) define 'inefficiency in the supply of products' as supply of the industry's vector of outputs at a total cost (significantly) higher than the minimum figure permitted by the production techniques that are known and available. In real terms, this means a waste of resources, that is, production represented by a point inside the production possibility frontier. It may result from

- inefficient choice of inputs,
- inefficient use of those inputs,
- inappropriate pricing of inputs,
- failure to adopt new cost saving production techniques or
- An inefficient organization of the industry so that it is composed of a number or size distribution of firms that does not minimize total costs.

Empirically it is not possible to spilt cost (in)efficiency into technical (in)efficiency and allocative (in)efficiency with single equation cost function model (Kumbhakar, 2000). Technical efficiency of a firm refers to the ability of the firm to obtain maximum output from a given set of inputs; and allocative efficiency of a firm refers to the ability of a firm to use the inputs in optimum proportions, given their respective prices (Coelli, 1996). While these information are available cost efficiency discussion can be carried out in terms of technical efficiency and allocative efficiency in a comparative situation.

CHATPER III: THEORY, ESTIMATION TECHNIQUES & DATA

3.0. Introduction

The study consists of two parts of analyses: - descriptive research analysis and empirical research analysis. The descriptive analysis is, in fact, a situation analysis, which is done using three types of analyses – trend analyses, comparative statistics analyses, and nonparametric statistics analyses where it is suitable. A trend analysis is used to analyse data in terms of time series to compare the changes of variables of interest over time. On the other hand, a comparative analysis technique is used to compare performance of cross-section units. A non-parametric statistics namely correlation coefficient analysis is used occasionally to investigate potential relationship between two types of variables of interests in our dataset statistically. An empirical analysis is the strength of the paper and is rested on the situation analysis. For empirical analysis cost functions to be estimated using suitable cost technology, and three issues of cost efficiency will be explored – (i) economies of scale, (ii) economies of scope, and (iii) level of cost efficiency measures in different universities.

The natural starting point for modelling behaviour of the public universities is the theory of firm – i.e. a collection of economic theories of multiproduct organization. Use of the theory of production in analysis of behavioural characteristic of education is often observed while the production unit is involved in producing single output with multiple inputs. In case of multiple inputs and outputs application of production function face limitation. Cost function is a dual formulation of production function and the dual formulation of production theory has made it possible to overcome the limitations of the traditional approach of using econometric tools in empirical analysis of production technology. The duality theory of cost function assures that for any cost theory satisfying certain regularity conditions, there is an underlying technology, which also satisfies similar regularity conditions. Therefore, it is possible to recuperate all the information about production technology without having to observe production function. It only

Table 10: Normality test results of the variables

Variable (notation)	Pr (Skewness)	Pr (Kurtosis)	Joint probability test	
			adj chi2(2)	Prob> chi2
Total cost (TC)	0.000	0.008	25.91	0.000
Undergraduate (ug)	0.000	0.022	24.09	0.000
Post-graduate (PGS)	0.002	0.001	16.04	0.000
Research	0.000	0.000	47.77	0.000
Average total salary (price)	0.096	0.740	2.96	0.227
Total number of teacher (tt)	0.000	0.003	28.93	0.000
Total number of non-teaching staffs (tnts)	0.000	0.102	19.30	0.000
Total number of professors and associate professors (tpap)	0.000	0.001	33.72	0.000
Total number of teachers with PhDs (phd)	0.000	0.002	3012	0.000
grant	0.240	0.798	5.09	0.0784
Age	0.000	0.001	29.57	0.000

CHAPTER IV: DESCRIPTIVE ANALYSIS

4.0. Introduction

The Chapter is concerned with descriptive analysis of the panel data for the eighteen public universities for the year 2002 – 2007. We use statistics like mean, median, ratio to analysis different issues involving three important interrelated areas of interests – outputs, costs of outputs, and factor inputs (or resources) utilisation in unit settings, and in temporal settings. Here we do comparative analysis among the universities. At the outset, we investigate outputs in the public universities in terms of two types of teaching outputs, and research outputs. In the following sections, an analysis of trends of total recurring costs at the institutional level is presented, followed by an analysis of growth of total recurring costs, and unit recurring costs We also analyse different cost compositions (or in other words expenditures for factor inputs) that contributes to the public university total recurring cost structure. Last sub-section of the Chapter embarks upon a very important subject related to human and non-human resources utilisation. This subsection unveils likely sources of cost inefficiency, if any, in the 18 public universities in Bangladesh.

4.1. Outputs analysis

4.1.1. Teaching outputs

It is already mentioned earlier in the Chapter II (conceptual framework) that total numbers of students enrolled into undergraduate and graduate degree programs (in other words gross enrolments into academic programs) are deemed two teaching outputs of a university. In order to conceive in-depth understanding about changes of total gross students' enrolment in the public universities, we take into account gross enrolments by individual university, and by the categories of the universities for the year 2002 – 2007.

We report in Table 11 about a general trend of teaching outputs (gross enrolments) in the universities for the year 2002 -2007, where the last column reports about average changes of outputs in percentages. Fig 12 is a graphical presentation of growth of teaching outputs (gross

Table: 27: Summary of key statistics

Name of university	Total full time Enrolment	Grad to Undergrad ratio	% of Non-academic staff	Student faculty ratio	Student non-faculty ratio	Per student space (feet)	Share of total compensation for staffs and teachers (%)	Share of total expend. for education(%)	Per student cost in BDT	Requirement minimum standards of education**
BAU	4594	2	82	10	2	81.25	77.56	8.90	129827.3	Faculty to
BDSMRAU	416	0	76	6	2	70.88	58.34	5.07	118516.9	student ratio
SAU	1094	2	74	13	2	82.96	51.78	12.73	79393.89	1:15 to 1:16
BUET	7645	1	68	16	8	85.90	64.43	12.77	47276.86	
CUET	1733	10	69	18	6	105.65	48.81	7.74	35475.92	
DUET	1477	20	66	14	6	72.38	77.04	12.19	33778.82	
KUET	1919	8	70	13	11	73.18	76.11	13.31	34304.61	Non-faculty
RUET	1497	19	67	14	6	13.36	72.17	10.14	35528.05	staff to
DU	18740	7	71	18	5	77.29	66.74	12.28	57481.18	student ratio
CU	14138	5	75	24	9	55.38	72.02	6.97	35376.55	1:14
JU	7830	3	77	19	6	52.80	72.43	10.99	40708.17	
IU	4999	3	69	30	7	73.02	70.26	7.45	34673.76	
RU	13694	3	70	25	6	71.19	68.86	7.41	48594.23	
KU	3469	11	50	14	13	68.45	65.91	15.26	23541.55	
SUST	5461	10	55	16	15	40.38	70.21	13.11	19338.49	
HMDSTU	860	15	75	12	4	34.34	63.73	13.15	48670.46	
MVSTU	429	0	95	11	2	128.37	53.34	6.11	104113.4	
PUST	733	4	76	15	1	126.96	54.21	9.33	58821.07	

* Source : Bowen (1980): p.235-240

CHATPER V: EMPIRICAL ANALYSIS

5.0. Cost equations estimation

A usual starting point for econometric model estimation may ponder over two likely problems: (i) self-selection of data used and (ii) endogeneity bias estimates of the parameter coefficients. We apply the panel data estimation techniques illustrated in the Chapter III in order to estimate parameter coefficients of the Equation (13), the Equation (14), and the Equation (16).

There are three likely sources for a self-selection bias regarding panel data:- (i) rotation of the panel, (ii) drop out of the panel, and (iii) missing variables in some point times within the panel (Wooldridge 2000:577-578). During our data collection we have experienced none of the above mentioned situations that has interfere in our data collection efforts. Therefore, we are confident that the dataset is free from self-selection bias problem. Regarding likely endogenous variables in our specific cost equations, we execute Hausman endogeneity test during econometric specification of the models. The results of them are reported already in the Chapter III. The results indicate that all the explanatory variables selected for the model specifications are exogenous.

Descriptive statistics of the dependent variable and the explanatory variables to be used for empirical studies are reported in Table 5.0. It is already mentioned that the selective variables have been transformed into natural logarithmic form (ln) in order to get rid of heterogeneity problems caused by the outliers in the dataset.

a) LSDV & GLS estimation for case one

We start estimating pooled-crossed stochastic frontier model by the Ordinary Least Square (OLS) estimation technique. Our estimated parameter coefficients are reported in Table 5.1 where it is labelled as Specification 1.

quality education is undeniable. We believe such variable has no costs implication as well.

As for how to meet additional fund required for higher education expansion, the study find that by enhancing cost efficiency the public universities can generate additional maximum funds equivalent to BDT 14.78 million per university.[45] However, enhancing cost efficiency is very vague argument as long as we do not find way (or any strategy) to do so. As such, given economies of scale in the public university, enhancing scale efficiency through increasing recruitments of students is the ultimate best choices for enhancing increasing cost efficiency as long as quality of education is not deteriorated.

[45] It is calculated dividing total recurring cost saving BDT 266.09 by total numbers of the public universities used in the study which is 18.

CHAPTER VI: CONCLUSION & RECOMMENDATION

6.0. Conclusion

Economics of education is a neglected area of academic discipline, and an area of research in Bangladesh; such negligence quite visible at the policy formulation level of the government of Bangladesh as well. The argument is supported by the perceived higher education expansion policy, a policy formulated and also published as a document titled 'Strategic Plan for Higher Education in Bangladesh: 2006-2026' by the UGC in the year 2006. The document create a thought to investigate a common popular issue -*cost efficiency* in the context of the public universities in Bangladesh. Since research in the area is missing in the Bangladesh context, even in any South Asian country context. Therefore, it provides an opportunity to create new knowledge that may ultimately expand the domain of already existing knowledge in other country context. Though the received literature on cost efficiency of the higher education intuitions is abundant, the results are inconclusive. That might be ascribed to various types of data used and methodology applied. Underlying common debates are directed toward methodological issues. Continuous methodological development further adds to the debate. The study is different from the past studies in terms of econometric approach used. For example, the study is based on application of OLS and MLS simultaneously for empirical investigation of issues pertaining to cost efficiency, where mean of all results found under applied econometric techniques are considered. The paper argue that the approach ensure robust results. Furthermore, the study does not keep the analysis limited to cost efficiency analysis, rather extend the analysis to explore the degree of economic benefit associated with cost efficiency of the total public university system in Bangladesh. Anyway, the main motivation of the research is to meet the academic requirement for a PhD degree at the Beijing Normal University in the year 2010.

There are two parts of the study – descriptive analysis and empirical analysis. The study is concerned explicitly with institutional recurring costs of the public universities of Bangladesh. We define

In Bangladesh, like other developed countries, the public universities continue to face mounting pressure from the government to use resources economically efficient ways in the face of increasing scarcity of funds. The book Costs Efficiency of the Public Universities explores practical uses involved in the measurement of the costs efficiency of the universities. The analysis is done by descriptive and empirical analysis of the Panel Data. The study sheds light on following three broad questions which arises. First, what are the key inputs and outputs? Secondly, what is the cost structure ? Thirdly, how do the universities perform in resources utilization? The descriptive analysis part of the study analyses issues concerning university outputs, institutional costs for inputs, and resources utilization. The empirical analysis part of the study estimates stochastic cost frontier equations, and thereby, analyses issues dealing with economic efficiency:estimates of economies of scale, economies of scope, demand for inputs in the universities, and finally potential cost saving associated with efficiency.This is the first ever study in the context of South Asian countries.

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